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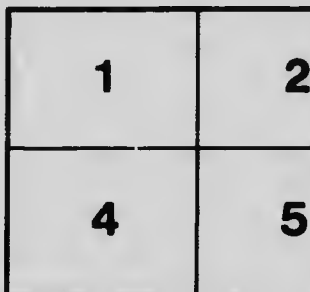
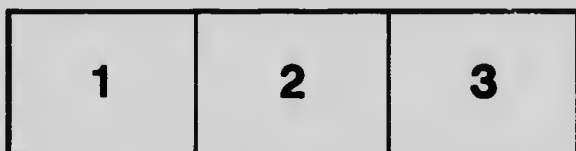
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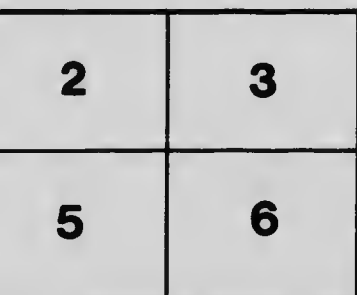
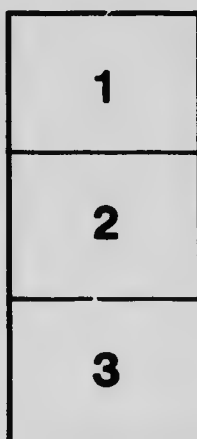
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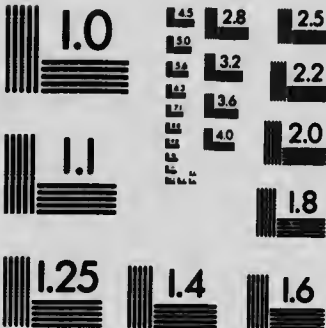
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DEPARTMENT OF AGRICULTURE

ENTOMOLOGICAL BRANCH.

C. GORDON HEWITT, DOMINION ENTOMOLOGIST.

Crop Protection Leaflet No. 4.

Root Maggots and Their Control.

In spring, when cabbages and cauliflowers are set out, or when radishes, onions, beans, and other plants appear above the soil, small flies, somewhat resembling the common house-fly but rather smaller and more slender, may be seen flying about close to the ground, depositing small, white, elongated eggs on the stems of the plants or adjacent thereto. These eggs hatch in a few days, and the small white maggots at once burrow down and destroy the roots. In the case of the Cabbage Root Maggot (*Phorbia brassicae* Bouché) there are three or four generations during the season. The Imported Onion Maggot (*Hylemyia antiqua* Mg.) also has several generations, and injury by these species may continue from May until autumn. The chief damage is effected in May and during June. The latter species, so far as we know, only attacks onion plants. Injury by the Seed-corn Maggot (*Phorbia fusciceps* Zett.) is largely confined to the seedlings of such plants as corn, beans, and peas. The annual loss caused by these insects in Canada amounts to many thousands of dollars.



Left hand plant—Showing properly placed disc.
Right hand plant—Carelessly placed disc. (Original).

* By Arthur Gibson, Chief Assistant Entomologist, in charge of Field Crop Insect Investigations.

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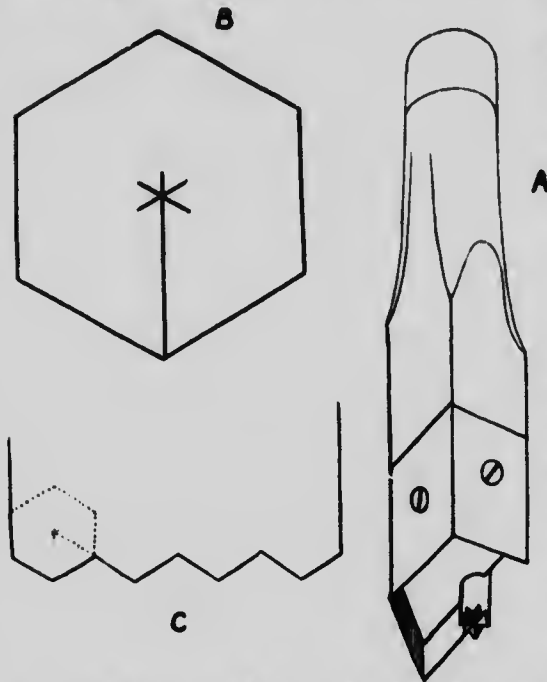
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MEANS OF CONTROLLING ROOT MAGGOTS.

The Cabbage Root Maggot.

One-ply Tarred Felt Paper Discs.—Cabbages and cauliflowers may be protected from injury by placing around the stems of each at the time they are planted out, a disc, hexagonal or square in shape, made of one-ply tarred felt paper. A tool, shown at



A—Tool used for cutting tarred felt paper discs, one-third size; B—Disc, about one-half size; C—Showing how the tool is used; the dotted line indicates the position of the edge of the tool. (After Goff).

A, for making the discs of the shape illustrated can be made by any expert blacksmith. The blades of the tool are made of steel bent in the form of a half hexagon and then taking an acute angle reach nearly to the centre. The part making the star-shaped cut is formed from a separate piece of steel so attached to the handle as to make a close joint with the blade. The dotted lines shown at C indicate how the tool is used. The edge of the tarred felt paper should first be cut by using one edge of the tool. By thus placing the tool where the dotted lines are shown and striking the handle with a hammer, or wooden mallet, a complete hexagonal disc is cut out similar to that shown at B. One yard of tarred felt paper is sufficient to make about 200 discs, each of which is $2\frac{1}{2}$ inches in diameter. Some growers use a square disc. For gardens requiring only a few discs, these could be easily cut out with a sharp knife. The square discs should be $2\frac{1}{2}$ inches by $2\frac{1}{2}$ inches, with a slit running from one side to

about a quarter of an inch beyond the centre and a cross cut made at the centre extending one-quarter of an inch on either side. It is important that the discs be placed around the stems of cabbages and cauliflowers immediately they are set out. In placing the disc, one side is raised sufficiently to allow the parts of the star at the end of the slit to point upwards and thus fit close to the stem. The whole disc is then pressed down firmly so that it will rest evenly on the ground.

Insecticides.—In small gardens, radishes may be largely protected by watering them, using an ordinary watering can with a small spout, once a week until they are ready for the table, with a decoction of fresh pyrethrum insect powder, or white hellebore, 2 ounces to each gallon of water, the first application to be made when the plants appear above the ground. Under acre or field conditions, the expense of such insecticides is prohibitive. In districts where turnips frequently suffer from root maggot attack, it is considered advisable to seed heavily.

Cheese Cloth Frames.—Frames covered with cheese cloth are useful for protecting plants from root maggots. At Ottawa we have used with success a frame 8 feet by 2 feet by 2 feet, covered with cheese cloth, which is placed over plants when they are

set out, or under which radishes and garden turnips are grown. Seed-beds may be protected from infestation by covering them with cheese-cloth frames to prevent the flies from gaining access to the plants to deposit their eggs. By such protection sound healthy plants may be grown for transplanting to the permanent field. In order to harden cabbages and cauliflowers grown in screened seed-beds, the screens should be removed about a week or ten days before transplanting.

Cultural Control.—As the maggots are present throughout the growing season, it is advisable to destroy promptly all remnants of crops, such as the stumps of cabbages and cauliflowers. The value of growing crops in different situations each year is, of course, undoubted. Crop rotation should therefore be practised, in which such above-mentioned crops are followed by plants other than those of the cabbage or mustard family.

The Imported Onion Maggot.

Poisoned bait spray.—Recent experiments have shown that the flies of the Onion Maggot are readily attracted to a poisoned bait spray made as follows:—

Sodium arsenite.	½ ounce.
Cheap molasses.	1 pint.
Boiling water.	1 gallon.

The sodium arsenite is first dissolved in the boiling water, and the molasses then added. When the mixture has cooled it may be applied from an ordinary watering can, with a small rose. The idea is to deposit the poisoned solution on the growing crop in the form of coarse drops. Acre plots of onions may be treated quickly by the operator beginning at one end of the plot and walking diagonally across the crop back and forward in a V-shaped manner, the strips being about 15 or 20 feet apart at the wide end. The first application should be made when the plants are about three or four inches high, and four or five further applications made about a week apart, choosing bright, calm days, so far as is possible, for such work. If the flies are present they will be readily attracted to the mixture, and killed before they lay their eggs.

Other Insecticides.—Under garden conditions, onion plants may be considerably protected by watering them once a week with decoctions of fresh pyrethrum insect powder, or of white hellebore, as mentioned for radishes.

Fortunately the Seed-corn Maggot is not a regularly-occurring pest. For this reason, it is extremely difficult for the farmer or market gardener, to anticipate the presence of the insect in his fields. The chief injury is to the seeds and young seedlings of such crops as corn, beans, and peas. The important preventives, we think, would be to sow vigorous seeds not deeper than one or two inches, in good season and in well-prepared soil. When seed is planted during a period of cold and damp weather, decay, of course, is liable to set in and the conditions possibly rendered more attractive to the adult flies for egg-deposition. As it is known that soil in which barn-

The Seed-corn Maggot.

yard manure has been used as a fertilizer is particularly subject to attack, it is advisable to avoid the use of such fertilizer as much as possible in fields in districts infested with the insect.

We shall be pleased to hear from any one concerning damage or trouble of any kind due to insect pests. No postage is required on such letters of inquiry when addressed—

*Dominion Entomologist,
Department of Agriculture,
Ottawa, Ont.*

Such inquiries should be accompanied, in all cases where it is possible, by specimens of the insects. The insects should be sent packed with their food plant in a strong wooden or tin box to prevent loss in transit. Packages up to 12 ounces in weight may be mailed free, and every package should bear or contain the sender's name and address, and be accompanied by a letter.

OTTAWA, February 26, 1918.





